(α, β, γ, δ integers positive or zero and $\alpha + \beta + \gamma + \delta = n$) and algebraic space curves requires a distinctly more advanced knowledge of plane analytic geometry. When mastered the student will understand what things in general concern an investigator in algebraic curve theory and will have a good working knowledge of the main properties of space cubic and quartic curves.

After such a surfeit of praise as the above contains, the reviewer felt it his duty to look very carefully for something serious to criticize; but what he found seems very trivial. Of course the ubiquitous typographical errors are there and the figure used in finding the distance between two non-intersecting lines would seem to have been drawn by one who did not consult the text of that particular paragraph.

Polar, spherical, and cylindrical coördinates are very nicely introduced at the beginning, but are not mentioned again. If they have a place in the analytic geometry of space, that place should be at least visible.

Practically all the problems have the answers given and there are not enough of them incorrect to be of any pedagogical value. The reviewer would like to see the pages of this MONTHLY opened to a discussion of the relative pedagogical values of complete, partial and no lists of answers, and of answers all correct or partially incorrect.

The definition of analytic curves in the last short chapter on differential geometry is obviously made so as not to alarm the reader and is not precise. Incidentally it is made without any explanation of what an analytic function is.

For American students, at least, I feel very strongly that such a book would gain much in effectiveness if the first chapters were devoted to a concise discussion of those theorems on determinants and matrices that will be of service in the succeeding chapters. A teacher, having in mind what is to follow, has a great opportunity to make his students appreciate the great power and elegance of determinants.

Let me say in conclusion that, with its splendid style, its fine choice and arrangement of material and its pedagogical excellences, I believe this book one of the best contributions to American text-books made in recent years.

E. GORDON BILL.

PROBLEMS AND SOLUTIONS.

EDITED BY B. F. FINKEL AND R. P. BAKER.

PROBLEMS FOR SOLUTION.

Note.—Of all the problems proposed between January 1, 1913, and January 1, 1915, satisfactory solutions for the following have not been received:

In Algebra, 406.
In Geometry, 427, 442, 446, and 454.
In Calculus, 339, 340, 342, 348, 353, 360, 363, and 368 to 375.
In Mechanics, 277–8–9, 287, and 291 to 301.
In Number Theory, 191–2, 196, 198, 205, 208–9–10–11, 214, 217, and 219 to 225.
Please give attention to these as well as to those proposed since January 1, 1915.

ALGEBRA.

433. Proposed by B. J. BROWN, student at Drury College.

Prove that, if all the quantities, a, b, etc., are real, then all the roots of the equations

$$\begin{vmatrix} a-x & h \\ h & b-x \end{vmatrix} = 0, \qquad \begin{vmatrix} a-x & h & g \\ h & b-x & f \\ g & f & c-x \end{vmatrix} = 0$$

are real; and generalize the proposition.

434. Proposed by S. A. JOFFE, New York City.

Express the "difference of zero," $\Delta^n 0^{n+1}$, in the form, $C_1(n+2)! - C_2(n+1)!$, where C_1 and C_2 are numerical coefficients independent of n.

435. Proposed by C. N. SCHMALL, New York City.

Show that $(e-1) - \frac{1}{2}(e-1)^2 + \frac{1}{3}(e-1)^3 - \cdots = 1$, where e is the Naperian base of logarithms.

GEOMETRY.

463. Proposed by B. J. BROWN, student at Drury College.

If μ and ν are the parameters of the two confocal conics through any point on the ellipsoid

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1,$$

show that $\mu + \nu + a^2 + c^2 = 0$, along a central circular section.

464. Proposed by FRANK R. MORRIS, Glendale, Calif.

The sum of the hypotenuse and one side of a right triangle is 100 feet. A point on the hypotenuse is 10 feet from each of the sides. Find the length of the hypotenuse correct to the third decimal place.

465. Proposed by ROGER A. JOHNSON, Western Reserve University.

Let C be a fixed circle, A a point outside it. Let AT and AT' be the tangents from A to the circle, touching the latter at T and T'. Let two secants be drawn through A, cutting the circle at P, Q and R, S respectively. Let PR and QS meet at X, PS and QR meet at Y. Prove by elementary methods that for all positions of the secants, X and Y lie on the line TT'.

CALCULUS.

383. Proposed by WILLIAM CULLUM, Albion, Mich.

Find the area of the curved surface of a right cone whose base is the asteroid, $x^{2/3} + y^{2/3} = a^{2/3}$, and whose altitude is h.

From Townsend and Goodenough's *First Course in Calculus*, p. 288, Ex. 11.

Note.—Among other methods, find the required area by means of the formula

$$\int \sqrt{1 + \left(\frac{\partial z}{\partial x}\right)^2 + \left(\frac{\partial z}{\partial y}\right)^2}\, dxdy.$$

EDITORS.

384. Proposed by JOSEPH B. REYNOLDS, Lehigh University.

In what time will a sum of money double itself at 6 per cent. interest per annum if compounded at indefinitely short intervals?

385. Proposed by H. B. PHILLIPS, Massachusetts Institute of Technology.

If $f(x)$ is continuous between a and x, show that

$$\lim_{n \doteq \infty} \frac{n!}{(x-a)^n} \int_a^x \cdots \int_a^x f(x) dx^n = f(a).$$